

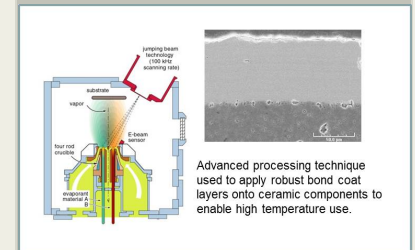
Robust High Temperature Environmental Barrier Coating System for Ceramic Matrix Composite Gas Turbine Components using Affordable Processing Approach, Phase I

Completed Technology Project (2014 - 2014)



Project Introduction

Research is proposed to demonstrate the use of advanced manufacturing techniques to enable the affordable application of multi-functional thermal / environmental barrier coatings (T/EBCs) having enhanced resistance to high temperature combustion environments. T/EBCs are envisioned to protect the surface of Si-based ceramics against moisture-assisted, oxidation-induced ceramic recession. Current T/EBC systems have been demonstrated in long time exposures at ~2400°F substrate temperatures. However, their use at elevated temperatures (i.e. 2700°F substrate temperatures) is limited by the low temperature stability and high diffusion activity of current T/EBC materials. One approach to increase the temperature capability of these systems is the incorporation of multi-layered T/EBC designs. In this Phase I effort, enhanced processing techniques will be employed to demonstrate the manufacture of robust T/EBC bond coat systems using a physical vapor deposition based processing approach which enables improved coating adhesion and advanced coating architectural, compositional and microstructural control, as well as non-line-of-sight (NLOS) deposition. Scaled processing approaches will then be used to demonstrate the deposition of high temperature capable T/EBC bond coats onto components of interest to gas turbine engine manufacturers. These bond coats will then be incorporated into full high temperature capable T/EBC systems planned in Phase II. Finally, concepts to enable the deposition of T/EBC bond coat systems on NLOS internal regions of hollow components will be investigated. This work will significantly aid the incorporation of Si-based ceramic components in gas turbine engines resulting in reduced weight and increased operating temperatures.



Robust High Temperature Environmental Barrier Coating System for Ceramic Matrix Composite Gas Turbine Components using Affordable Processing Approach Project Image

Table of Contents

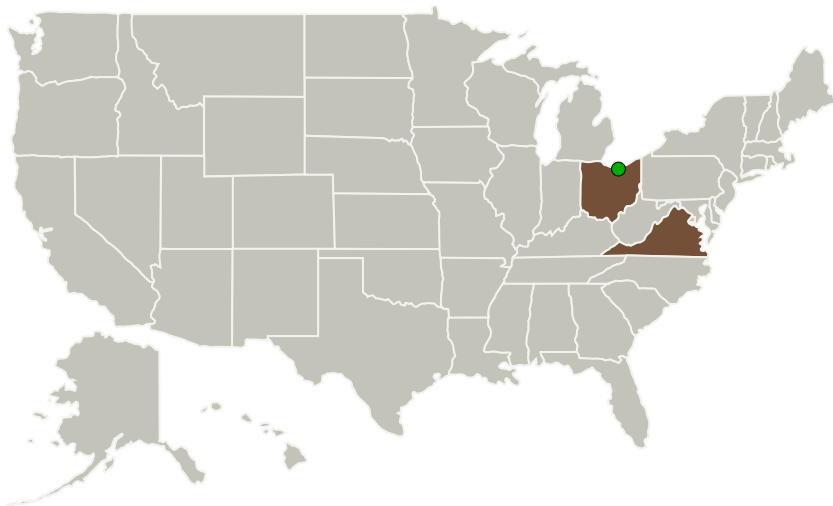
Project Introduction	1
Primary U.S. Work Locations and Key Partners	2
Project Transitions	2
Organizational Responsibility	2
Project Management	2
Images	3
Technology Maturity (TRL)	3
Technology Areas	3
Target Destinations	3

Robust High Temperature Environmental Barrier Coating System for Ceramic Matrix Composite Gas Turbine Components using Affordable Processing Approach, Phase I

Completed Technology Project (2014 - 2014)



Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Directed Vapor Technologies International, Inc	Lead Organization	Industry	Charlottesville, Virginia
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations

Ohio	Virginia
------	----------

Project Transitions



June 2014: Project Start



December 2014: Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/140512>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Directed Vapor Technologies International, Inc

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

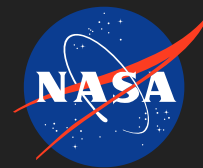
Carlos Torrez

Principal Investigator:

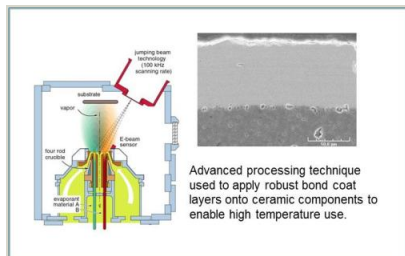
Balvinder Gogia

Robust High Temperature Environmental Barrier Coating System for Ceramic Matrix Composite Gas Turbine Components using Affordable Processing Approach, Phase I

Completed Technology Project (2014 - 2014)



Images

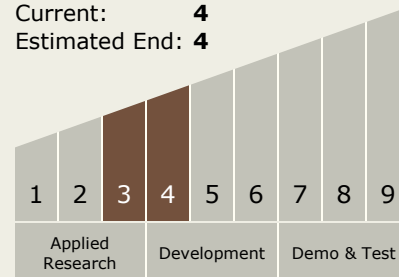


Project Image

Robust High Temperature Environmental Barrier Coating System for Ceramic Matrix Composite Gas Turbine Components using Affordable Processing Approach Project Image (<https://techport.nasa.gov/image/126748>)

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - TX12.1 Materials
 - TX12.1.1 Lightweight Structural Materials

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System